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ABSTRACT

This study was designed to construct a gross muscular strength test battery for girls 6-9 years of age in grades 1-3. The subjects for this investigation were a random sample of 183 girls in grades 1-3 of the public schools of Natchitoches, Louisiana. The variables selected were 22 cable tension strength tests developed by Clarke and associates. The instrument selected for use was a 200 pound cable tensiometer. Subjects were administered the cable tension strength tests in a specific sequence which was selected for purposes of practicality and ease of administration. After completion of testing, the data were statistically treated in the following manner. Intercorrelations between all experimental test items were computed using the Pearson product-moment formula. The correlation coefficients were factor analyzed according to the principal axes method of factor analysis with the varimax criterion for rotation. As a result of this factor analysis, Knee Flexion, Shoulder Outward Rotation, and Hip Adduction were selected as the cable tension strength test items to include in a gross muscular strength test battery for girls in the lower elementary grades. (JA)

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THE CONSTRUCTION OF A MUSCULAR STRENGTH TEST BATTERY* FOR GIRLS IN THE PRIMARY GRADES

by

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INTRODUCTION

Physical educators have long recognized muscular strength as a basic component of physical fitness and strength development as an important objective of physical education programs. Muscular strength test batteries have been developed to evaluate the strength development of boys and girls from grade 4 through college but very little research relative to muscular strength has been conducted utilizing lower elementary children because valid, reliable, and objective, strength test batteries have not been available.

STATEMENT OF THE PROBLEM

The purpose of this study was to construct a gross muscular strength test battery for girls 6 to 9 years of age in grades one, two, and three.

METHODOLOGY

The subjects for this investigation were a random sample of 183 girls in grades one, two, and three of the public schools of

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Natchitoches, Louisiana. Included in the sample were 62 girls from grade one, 62 girls from grade two, and 59 girls from grade three. The subjects ranged in age between 6 and 9 years and were free of any physical abnormality or organic deficiency.

The variables selected for this study were 22 cable tension strength tests developed by Clarke and associates. These specific variables were selected on the basis of previous research conducted in the area of strength test construction. The cable tension strength test items selected for inclusion in this investigation were as follows.

1. Wrist dorsi flexion
2. Elbow flexion
3. Elbow extension
4. Shoulder flexion
5. Shoulder extension
6. Shoulder abduction
7. Shoulder adduction
8. Shoulder inward rotation
9. Shoulder outward rotation
10. Knee flexion
11. Knee extension
12. Trunk flexion
13. Trunk extension
14. Trunk lateral flexion
15. Hip flexion
16. Hip extension
17. Hip abduction
18. Hip adduction
19. Hip inward rotation
20. Hip outward rotation
21. Ankle dorsi flexion
22. Ankle plantar flexion

The instrument selected for use in this investigation was a 200 pound cable tensiometer manufactured by Pacific Scientific Supply of Anaheim, California and carried catalog number 75-6007-114-00. This instrument was calibrated prior to use by the Toledo Scale Company of Shreveport, Louisiana to insure the accuracy of tension readings. The test equipment and instructions were those

proposed by Clarke and Clarke. Certain modifications in strap size were necessary due to the small physical dimensions of the participating subjects and these adjustments were made as the result of a pilot study conducted prior to this investigation.

Tester competency was acknowledged when test-retest correlations from the administration of selected tests to the same subjects reached a coefficient of correlation of .900 or above. These coefficients compared favorably with reliability and objectivity coefficients reported in previous research.

Subjects were administered the cable tension strength tests in a specific sequence which was selected for purposes of practicality and ease of administration. All testing was accomplished in a thirteen week period during the spring of 1972 and was organized in such a manner that subjects were not required to take more than one test item each day. In all instances instructional terminology was modified to correspond with the maturational levels of the students.

DATA ANALYSIS

After completion of the testing, the data were statistically treated in the following manner. Intercorrelations between all experimental test items were computed using the Pearson product-moment formula. The correlation coefficients were factor analyzed according to the principal axes method of factor analysis with the varimax criterion for rotation.

The factor analysis of the 22 experimental variables yielded three strength factors with eigenvalues above 1.000 and accounting for 57 percent of the total variance. The highest loading variable on Factor I was Knee Flexion (.695) followed closely by Ankle Plantar Flexion (.686), Hip Outward Rotation (.665) and Hip Inward Rotation (.665). Additionally, several other variables had factor loadings that were rather close to that of knee flexion.

The highest loading variable on Factor II was Shoulder Outward Rotation (.735) followed by Shoulder Inward Rotation (.719), Shoulder Abduction (.675) and Wrist Dorsi Flexion (.666).

For Factor III, the highest loading variable on this factor was Hip Adduction (.715). The only other variable with a factor loading approaching this magnitude was Hip Extension (.549).

As a result of this factor analysis, Knee Flexion, Shoulder Outward Rotation, and Hip Adduction were selected as the cable tension strength test items to include in a gross muscular strength test battery for girls in the lower elementary grades.

Rotated Factor Matrix

Variables	Factor I	Factor II	Factor III
1. Wrist Dorsal Flexion	.139	.666	-.266
2. Elbow Flexion	.659	.195	.214
3. Elbow Extension	.558	.454	.116
4. Shoulder Flexion	.582	.450	.107
5. Shoulder Extension	.597	.400	.395
6. Shoulder Abduction	.372	.675	.236
7. Shoulder Adduction	.628	.269	.319
8. Shoulder Inward Rotation	.289	.719	.285
9. Shoulder Outward Rotation	-.042	.735	.465
10. Trunk Flexion	.428	.300	.446
11. Trunk Extension	.584	.143	.260
12. Trunk Lateral Flexion	.515	.259	.329
13. Hip Flexion	.572	-.008	.492
14. Hip Extension	.572	.106	.549
15. Hip Inward Rotation	.665	.335	.145
16. Hip Outward Rotation	.665	.245	-.101
17. Hip Abduction	.495	.190	.398
18. Hip Adduction	.071	.012	.715
19. Knee Flexion	.695	.209	.036
20. Knee Extension	.403	.619	.022
21. Ankle Dorsi Flexion	.524	.522	.029
22. Ankle Plantar Flexion	.686	.157	.281